about 2000 figures, illustrating every known genus of diatoms, and every species found in the North Sea and countries bordering it, including Great Britain.

THE second edition of "Elements of Marine Surveying," by the Rev. J. L. Robinson, lately published by Messrs. Macmillan and Co., contains several very useful additions and improvements. Young marine surveyors will find the volume an excellent aid to the study of the theoretical side of their profession, and would do well to include it in their outfit.

PARTICULARS of editions of Gilbert White's "Natural History and Antiquities of Selborne" have been compiled by Mr. Edward A. Martin, for the Selborne Society. Since the original edition was published in 1789, twenty-three other editions have appeared. The list compiled by Mr. Martin, gives the dates of the various editions, publishers, printers, editors, number of pages, and general description.

THE annual report of the Royal Botanic Gardens, Trinidad, for the year 1894, compiled by the Superintendent, Mr. J. H. Hart, furnishes evidence of the practical value of these colonial botanic gardens, and of their relation with the central institution at Kew. Under the Economic Section, information is given of the growth in the island of the sugar-cane, cacao, coffee, yam, gambier, vanilla, the Brazil nut, and cola, and of the principal enemies of these crops, and the best mode of combating them.

WE have received Part i. of "The Flowering Plants and Ferns of New South Wales," with especial reference to their economic value, by Mr. J. H. Maiden, assisted by Mr. W. S. Campbell, and issued under the authority of the Department of Mines and Agriculture for New South Wales. The present part contains descriptions and coloured drawings of four species—*Telopea speciosissima*, *Eucalyptus corymbosa*, *Actinatus helianthi*, and *Acacia glaucescens*. It is intended in this way to illustrate the principal flowering plants and ferns of the colony.

THE additions to the Zoological Society's Gardens during the past week include a Panolia Deer (*Cervus eldi*, ♂) from Hainan, presented by Mr. Julius Neumann; a Ruddy Ichneumon; (*Herpestes smithii*) from India, presented by the Earl of Hopetoun; a Spotted Ichneumon (*Herpestes nepalensis*) from India, presented by Mrs. Thompson; a Rosy-faced Love-Bird (*Agapornis pullaria* from West Africa, presented by Mr. Cecil M. Bevan; a Rufescent Snake (*Leptodira rufescens*) from South Africa, presented by Mr. J. E. Matcham; a Spiny Tree Porcupine (*Sphingurus spinosus*) from Peru, a Blossom-headed Parrakeet (*Palæornis cyanocephala*) from India, two Tuberculated Iguanas (*Iguana tuberculata*) from South America, deposited; two Guira Cuckoos (*Guira pirirgua*) from Para, purchased; a Japanese Deer (*Cervus sika*, ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE MOTION OF THE SOLAR SYSTEM.—The methods elaborated by Argelander and Airy for the numerical solution of this problem have been followed with more or less variation by a host of investigators. As a rule the deviations in method have involved matters of detail rather than any fresh departure. Various suppositions have been made as to the motions of the stars themselves (*motus peculiares*): that the magnitude and direction of these motions have no connection with position, or that, in general, all these motions take place with the same angular velocity parallel to the galactic circle. Stars may be grouped according to their brilliancy, or the amount of their proper motion, or they may be arranged with more or less ingenuity according to their apparent position; but when the final equations are solved, the results are found to be fairly accordant. This fact has been recently demonstrated by M. Pannekoek, who, to vary the problem as much as possible, has based his investigations on the type of spectrum presented by the star. The zone from which the stars are selected is somewhat limited, being restricted to 0°—20° of declination, the spectra of which have been observed at Potsdam. The stars have been divided into four groups, according to the amount of the proper motion, with the following results:—

Stars of the First Type.

	No. of stars.	Centennial proper motion.	Position of apex. R.A. (α).	Declination (δ).
		″	° °	° °
I.	203	2·11	322·8±19·2	+14·7±7·0
II.	93	5·58	304·7± 4·6	+12·1±3·4
III.	58	9·84	275·8± 6·1	+18·3±3·6
IV	48	34·36	251·6±12·1	+33·0±7·3
		Stars of the Second Type.		
I.	77	2·07	274·6± 9·6	– 2·6±6·3
II.	52	5·93	280·1± 9·9	+35·8±6·5
III.	65	20·85	268·6± 7·1	+31·4±4·6

The result derived from stars of small proper motion of either the first or second type of spectra is scarcely accordant with previous investigations. The Right Ascension of the one and the Declination of the other are sensibly different from results involving larger numbers of stars. The author remarks, however, that all the values in R.A. can be rendered less discordant by an increase in the constant of precession of +0″·01, and in Declination by assuming a constant negative error in the proper motions themselves. Here we have again evidence that no rearrangement of groups materially alters the position assigned for the apex of the sun's way; but when processes sensibly different in their conception are employed, the accordance in the results is not so gratifying. For instance, the attempt to determine the position of the apex from Vogel's measurements of the motion of stars in the line of sight led to either of the two results, according to the method of "weighting" employed.

	I.	II.
	° °	° °
α	206·1±12·0	159·7±20·2
δ	+ 45·9± 9·2	+ 50·0±14·3

Here, if the Declination be fairly satisfactory, the Right Ascension is hopelessly discordant. On the other hand, Dr. Kobold's treatment of the problem according to the graphical method suggested by Bessel, a method which does not easily lend itself to numerical treatment, gives a fairly satisfactory result in R.A., but the Declination will scarcely be accepted. The position assigned to the apex by this method is α = 266°·5; δ – 3°·1. This result is based on 1425 stars, and ought to be entitled to considerable weight if it could be satisfactorily demonstrated that all ambiguity, which arises from the definition of the poles of the great circles in which the proper motions take place, had been satisfactorily removed. This question is still *sub judice*, and while distinct methods give conflicting results, it is not wise to insist too strictly on the direction of the motion of the solar system.

THE ROTATION OF MARS.—Among numerous observations of the planet Mars during the last opposition, Mr. Percival Lowell gave his attention to the measurement of the longitudes of some of the more conspicuous markings. The observations covered 36 points in all, and were made with a power of 440 on the 18-inch refractor of the Lowell Observatory. The first fact that emerged from the observations was that all the longitudes as given in Marth's ephemeris were affected by a systematic error of about 5°; or, in other words, the Martian features were retarded by about twenty minutes as compared with the computed times. The cause suggested for the discrepancy between the calculated and observed positions is that the received time of rotation of the planet is a trifle too small, and that the longitudes are consequently falling slowly behind their predicted times of meridian passage.

A somewhat similar discrepancy appears to have been noted by Prof. Keeler in 1892, who ascribed it partially to the constant error in estimating the position of the diameter of a large disc (*Astrophysical Journal*, May).

THE SUN'S STELLAR MAGNITUDE.—A new method of computing this important constant, being the number representing the sun's brightness on the scale in which the magnitudes of stars are represented, has been employed by Mr. Gore (*Knowledge*, June). Taking one of the outer planets, the known size and distance

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enable us to determine the fraction of the sun's light which it receives, and correcting for the albedo, it is easy to calculate the brightness of the sun in terms of that of the planet, the exact stellar magnitude of which can be found by direct measurement. Thus, Mr. Gore finds that the apparent diameter of Mars in opposition, as seen from the sun, is 6″·17, so that the area of the disc is 29·9 square seconds. Dividing the number of square seconds in a hemisphere by the latter, it is found that if the surface of Mars were a perfect reflector, the sun as seen from Mars would be 8,940,450,000 times brighter than Mars appears to us when in opposition.

According to Zöllner, the reflecting power of Mars is only 0·2672, so that the previous number must be raised to 33,459,768,000. This, however, is for mean distance 1·5237, so that when reduced to the earth's distance (by multiplying by the square of 0·5237), we get the light of the sun as seen from the earth to be 9,174,668,385 times the light of Mars when in opposition; this number, on the basis of a light ratio of 2·512 corresponding to a difference of 1 magnitude, represents 24·9 magnitudes. Prof. Pickering's photometric measurements show that the stellar magnitude of Mars at mean opposition is 2·25, so that the deduced stellar magnitude of the sun is −27·15. Similar calculations from the data relating to Jupiter give a value of −27·17, and from Saturn −27·11. Though agreeing so remarkably among themselves, these new values differ very considerably from the value hitherto adopted, namely −25·5. The new value, however, receives confirmation in the fact that it is very nearly equal to the magnitude which α Centauri would assume if it were brought to the sun's distance from the earth, assuming the parallax to be 0″·76, the spectrum of this star resembling the spectrum of the sun.

THE GREENWICH OBSERVATORY.

THE Report of the Astronomer Royal to the Board of Visitors of the Royal Observatory, Greenwich, was read at the annual visitation on Saturday. A few of the developments made during the year covered by the report, and some observations of interest, are referred to in the subjoined extracts.

Provision has been made in the Navy Estimates for the erection in Greenwich Park of a magnetic pavilion for absolute determinations of the magnetic elements, and the plans are now being prepared in the Director of Works' Department. It is proposed to establish this station in the immediate neighbourhood of the Observatory, and at such a distance that there would be no suspicion of disturbance from the iron in the buildings.

Work with Equatorials.

The flint and crown discs for the new photographic telescope of 26 inches aperture, the gift of Sir Henry Thompson, have been received at the Observatory. The details of the design for the mounting have been carefully worked out, and good progress has been made with the mechanical work.

The 28-inch refractor has been in use throughout the year, and is quite satisfactory. It moves easily in R.A. and Declination, the new slow motion screws work successfully, the water clock in general drives it with great precision, and the performance of the object glass under good atmospheric conditions is admirable. Various improvements in the accessories of the instrument have been carried out in the past year. A spectroscope specially adapted to photography, for use with this refractor, is being made.

Micrometer measures of sixty-three double stars have been made; in 27 of these the distance of the components was under 1″, and in 13 it was 0″·5 or under. The most remarkable of these measures are those of κ Pegasi (β 989). The components of this star, though only 0″·14 apart, were distinctly separated with a power of 1030.

Measures of the positions of satellites of Mars near elongation were made on two nights. Several attempts were also made to measure Jupiter's fifth satellite, but the results obtained were discordant. A series of measures of the polar and equatorial diameters of Jupiter and his satellites was made. Measures of the dimensions of Saturn and his rings and the positions of the satellites have also been made, and are being continued.

With the astrographic equatorial 595 plates, with a total of 1450 exposures, have been taken. Of these, 162 have been rejected for various reasons, such as:—partially fogged plates; because the reticules were not clearly printed; because the images were too faint to show 9th magnitude stars with a twenty-seconds exposure; for faults in development; for mistakes of setting; and for miscellaneous defects. It is hoped that a much smaller number of plates will need to be rejected in future for these causes.

The total number of celestial fields photographed since the commencement of work for the chart is 422, and the total number of fields photographed for the catalogue is 617. Only half as many fields for the chart and catalogue have been photographed this year as during last year. This is due partly to the unfavourable weather, and partly to the telescope being out of use for two months while the shutter of the dome was being repaired.

Spectroscopic and Heliographic Observations.

Since 1894 December 19, when the spectroscope was brought into adjustment, 98 measures have been made of the displacement of the F line in the spectra of 13 stars, and 16 of the *b* line in the spectra of four stars. Some experiments have also been made in photographing stellar spectra, to give data as to the work to be done with the new photographic spectroscope.

Photographs of the sun were taken with the Dallmeyer photoheliograph on 199 days, and of these 375 have been selected for preservation, besides 18 photographs with double images of the sun for determination of zero of position-angle.

The 9-inch photographic telescope presented by Sir Henry Thompson, which has been mounted on the Lassell equatorial, was also in regular use as a photoheliograph up to October 15, when the progress of the building operations prevented its further use. Photographs of the sun had been obtained with it by that time on 80 days, of which 121 have been selected for preservation. In all, with one photoheliograph or the other, a record of the state of the solar surface has been secured on 213 days during the year.

The mean daily spotted area of the sun was only slightly smaller in 1894 than in 1893, the marked falling off in the spring of 1894 noted in the last report being followed by an increase during the summer months. The number of sun-spots was greater than in 1893. The spring of this year has shown a decline both in the number and area of spots.

Magnetic Observations.

The variations of magnetic declination, horizontal force and vertical force, and of earth currents have been registered photographically, and accompanying eye observations of absolute declination, horizontal force, and dip, have been made as in former years. Increased magnetic activity was shown in the year 1894, and great disturbances occurred on July 20 and August 20; the spot of light of the vertical force magnet, on the former date, and the spots of light of the horizontal force and vertical force magnets, on the latter, having passed beyond the range of the registering sheets for some hours. In July and August the disturbances in the earth-current registers caused by the South London Electric Railway showed a great increase, which is presumably due to the experiments then being made in the use of motors on the carriages of the railway instead of separate locomotives.

The following are the principal results for the magnetic elements for 1894:—

Mean declination	17° 4′·6 West.
Mean horizontal force	3·9661 (in British units). 1·8287 (in metric units).
Mean dip	67° 16′ 5″ (by 9-inch needles). 67° 17′ 8″ (by 6-inch needles). 67° 18′ 43″ (by 3-inch needles).

In the year 1894 there were ten days of great magnetic disturbance and thirteen other days of lesser disturbance. Tracings of the photographic curves for all of these days are being made, and will be published in the annual volume according to the arrangements made with M. Mascart. The calculation of diurnal inequalities from five typical quiet days in each month has been continued.

Meteorological Observations.

The registration of atmospheric pressure, temperature of the air and of evaporation, pressure and velocity of the wind, rainfall, sunshine, and atmospheric electricity has been continuously maintained, except that during the winter the register of atmospheric electricity was interrupted during the greater part of February by freezing of the water in the exit pipe.

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